April 1957

INFORMATION ON
LEPTOSPIROSIS

Animal Disease Eradication Division

Agricultural Research Service
U. S. DEPARTMENT OF AGRICULTURE

FOREWORD

Leptospirosis continues to be a disease of economical importance and is of considerable concern to the livestock industry of our country.

Many questions are received by our field veterinarians in their day-by-day contacts with livestock owners. There have been many articles published and papers given on the different aspects of leptospirosis, but they are not always readily available for reference.

We have attempted to anticipate some of these questions and have furnished the answers that are available, based upon the current knowledge of the disease.

R. J. Anderson

R. J. Anderson
Director, Animal Disease
Eradication Division

LEPTOSPIROSIS

QUESTIONS AND ANSWERS

1. WHAT IS LEPTOSPIROSIS TO THE LIVESTOCK RAISER?

Leptospirosis is an infection of farm animals caused by Leptospirae. Infection often originates in rodents, but three types are established in domesticated animals of the United States. Many infections with Leptospirae are without visible symptoms, but unthriftiness is common. Acute cases have a tendency toward hemorrhages in various organs. Hemolytic anemia and bloody urine are symptoms frequently observed.

Abortion is common in pregnant cattle and swine and a non-inflammatory mastitis may occur in milk cows. Jaundice may be observed in dogs and cattle but is one of the less common symptoms of leptospirosis in swine. Infection of the brain and its covering, which would lead to nervous symptoms, rarely occurs in domestic animals. Liver and kidney damage results in general derangements, and unthriftiness occurs until repair is complete.

2. WHAT SPECIES OF ANIMALS ARE INFECTED?

Rodents are frequently infected with various serotypes and they may serve as

reservoirs of infection for domestic animals and man. Dogs are infected with Leptospira canicola. They are sometimes infected with the sero-type, L. icterohemorrhagiae common to rats. In cattle and swine, an almost universal distribution of L. pomona has been found. Dogs and related species may infect cattle and swine with L. canicola. A rodent strain, L. sejroe, infects cattle in Denmark, and although serological evidence has been found, this organism has not yet been isolated in the United States. Horses develop ophthalmic disease, occasionally, when infected with L. pomona, but do not appear to be spreaders of infection. Chickens and other fowl are not naturally infected, and resist experimental infection after three weeks of age.

3. HOW DOES THE DISEASE SPREAD?

Animals infected with Leptospirae frequently shed organisms in the urine. If urine carrying Leptospirae is splashed in the eyes or nostrils or there is dermal contact, penetration of the mucous and cutaneous membrane may follow. Infection by mouth is believed to be frequent by ingesting Leptospirae from infected water or milk. Urine discharged into water holes is believed to be a common source of infection. Leptospirae have been found to remain viable in water holes which are slightly alkaline.

4. WHAT IS THE INCUBATION PERIOD, MORBIDITY, AND MORTALITY?

The acute form of leptospirosis in cattle is a hemolytic anemia and icterus associated with varying degrees of dehydration. A temperature of 105° to 107° F. is common. Conjunctival complications resembling pink-eye have been described for the several species of domestic animals affected.

The subacute form is much milder, but with the same symptoms. This stage is more often detected by a marked reduction in milk production, or other evidence of general debility. The milk from infected cows occasionally appears thick and yellowish in color giving the appearance of colostrum.

Abortion during the last three months of gestation may be the first symptom of disease. Leptospirosis is probably not a genital infection, and the death of the fetus is probably associated with metabolic disturbances in the dam's health.

The morbidity, including abortions, varies widely, but in serious outbreaks may involve 20 to 40 percent of the herd. A much larger incidence of infection in a herd is usually detected by serological blood tests. Mortality, loss of weight of beef animals, and reduced milk production varies widely with the severity

of the systemic disturbance. Very serious outbreaks with the loss of several animals have alarmed some to the potentialities of leptospirosis. A much wider distribution of subclinical leptospirosis is indicated by serologically positive, normal-appearing animals. Additional effects of infection can be measured in poor gains especially in young animals concentrated in feed lots.

5. HOW DO WE CLASSIFY LEPTOSPIRAE?

Present method of classifying Leptospirae is incomplete, but a practical method is in use. Various strains of Leptospirae maintained in a reference laboratory are tested against each other by agglutination-lysis tests. Various cultures exhibiting similar serological reactions are designated as a serotype. For example, Leptospirae from cattle and swine in various parts of the world react similarly. This serotype is designated Leptospira pomona. There may be some cross reaction between this organism and other Leptospirae.

6. WHAT LABORATORY TESTS ARE AVAILABLE?

The actual isolation of Leptospirae from tissue is a difficult procedure accomplished only by immediate transfer between hosts. The organisms are believed to undergo lysis quite rapidly in the presence of decomposing tissue. Animal inoculation may be successful, particularly

if young hamsters or guinea pigs are immediately injected with urine from recently recovered cases. Isolation of Leptospirae from an aborted fetus may be possible only with fresh material. Serological tests are widely used, and a rise in titer on consecutive samples is expected following recent infection. It is important to resubmit serum samples on suspect cases, since the first sample collected may have no or a very low titer.

The choice of leptospirosis test to be used largely depends upon the purpose of testing. Detailed research on multiple serotypes may require tests for specific agglutinins while survey for the incidence of herd reactions may be accomplished by the simpler plate agglutination using a killed and fixed antigen.

The problems in the present day study of leptospirosis are many-fold. The standardization of techniques and the proper interpretation of tests will aid in unification of research and field investigations and afford a better understanding of true problems resulting from leptospirosis.

The complement-fixation, agglutination absorption and agglutination-lysis (microscopic) are quite sensitive tests. When these tests are conducted under the most rigid controls by experienced personnel, the cumbersome techniques and variations

in sensitivity are limiting factors for routine work.

The U. S. Department of Agriculture is currently interested in the incidence of leptospirosis in cattle and swine. The primary interest of the Animal Disease Eradication Division is being concentrated on the incidence of reactions from L. pomona, commonly affecting farm animals. This work strongly suggests the use of the macroscopic plate agglutination test for routine field investigation. The plate agglutination test requires a standardized, fixed antigen and serum from cattle, and may serve as a practical and economical means of locating reacting animals and herds, which will constitute a preliminary survey.

7. IS THERE ANY TREATMENT FOR LEPTOSPIROSIS?

Leptospirae are not affected by therapeutic levels of the sulfa drugs, and varying success follows treatment with antibiotics. Antibiotic treatment is often instituted; however, no specific data are available to indicate benefits other than those of assisting the natural defenses of the body. Blood transfusions have been attempted as treatment during the anemic stage of the disease. The transfusions would have supplemental value if the donor was an immune animal.

8. HOW PERMANENT IS THE IMMUNITY PRODUCED BY THE DISEASE?

Once an animal is infected with a strain of Leptospira, a second infection of the same species is unlikely. So-called leptospirosis carriers are encountered and found by retention of serological reactions and recovery of the organism frequently six months to over a year after the visible symptoms have subsided.

9. HOW LONG DO RECOVERED ANIMALS SHED LEPTOSPIRAE?

Infected cattle may shed Leptospirae for several months after the clinical phase has passed. Leptospirae carriers may incite new outbreaks after long intervals of time when in close contact with susceptible animals. Dogs and swine may carry the infection for months and even years.

10. HOW EFFECTIVE ARE LEPTOSPIRA BIOLOGICS?

The effectiveness of Leptospira bacterins must be considered in respect to the exposure in the vaccinated herd. In serious outbreaks, the natural exposure is quite high, and many of the animals develop titers without evidence of disease. Vaccination in this case may be credited unjustifiably with bringing the disease under control. The amount of immunity

stimulated by the bacterin may protect a negative animal about six months. Certain State control programs recommend that leptospirosis biologics be administered promptly after the first few abortions occur. Latent recognition of the disease as much as 4-6 weeks, should be handled by first testing all animals and only the negative animals vaccinated to hasten the eventual elimination of infection. Further research and numerous field trials are needed to evaluate the importance of bacterins.

11. WHAT IS THE DURATION OF IMMUNITY FROM VACCINATION?

It is doubtful if varying degrees of immunity can be demonstrated longer than six months but occasionally protection may persist longer. Until further research data are available the answers to this problem will be unsolved.

12. SHOULD ALL ANIMALS IN THE INFECTED HERD BE VACCINATED?

Since the disease will probably be diagnosed on the basis of a serological test, it may be found only the animals negative to the test need be vaccinated.

13. HOW YOUNG SHOULD CATTLE AND SWINE BE VACCINATED?

The young of immune animals theoretically gain protective antibodies through

the milk as indicated by the fact that calves born to sero-positive cows are rarely affected. However, no positive evidence is available to indicate they are immunized. If the mother has recovered from infection prior to parturition, immunity through the milk for the duration of the nursing period can be expected.

14. WHAT IS THE PUBLIC HEALTH SIGNIFICANCE OF LEPTOSPIROSIS IN CATTLE AND SWINE?

Man can become infected by L. pomona and some serious outbreaks have followed exposure by swimming in water contaminated by animals. Under the usual conditions of farm management in the United States, the persons associated with the infected herd seldom have significant titers indicating infection. It must be kept in mind that infection can occur, however, and any sickness should be reported to the health authorities. Leptospirosis in man may resemble influenza, pink-eye, and a number of other eye conditions and frequently, meningitis. Meningitis is probably one of the most common manifestations, especially with such serotype as L. canicola and L. pomona.

15. SHOULD RESTRICTIONS BE PLACED ON A DAIRY HERD IN WHICH THE DISEASE HAS BEEN DIAGNOSED?

While it is obvious that all clinical cases of leptospirosis should be excluded

from the milk line, it is obviously impractical to quarantine a herd for leptospirosis. In addition to the impracticality, there is a notable lack of evidence of transmission of infection through the milk. Where actively infected herds are located and no quarantine is applied, rigid herd management practices and sanitation should be followed to prevent further spread of the disease. Milk after being drawn for some time will not support the growth of Leptospirae, and will actively lyse most of the organisms. Pasteurization will destroy Leptospirae readily. Persons drinking milk containing Leptospirae probably would not become infected, since the acidity of the stomach is leptospiricidal. The exception being that infection through the mucosa of the pharynx and tonsils is possible.

16. HOW CAN FARM MANAGEMENT INFLUENCE THE DISEASE?

Leptospirae from carrier animals are spread by animal contact, contact with infected feed and equipment, as well as by water and in moist environments. Watering in shallow streams and ponds should be prevented if possible. Fencing all but a part of a stream, so that one animal can drink at a time, will be of help. Water tanks below fenced ponds are desirable, and have other benefits in disease control.

Recovered animals may become carriers of infection, spreading the disease for months and in the case of swine, even years. The owner should develop a herd which is immune to leptospirosis, or have one without reactors to Leptospira serological tests. While serious outbreaks can be reduced or prevented by careful management, breaks can at times be expected in herds where carrier animals are found.

17. DOES LEPTOSPIRAE CAUSE PERIODIC OPHTHALMIA IN HORSES?

The exact cause of periodic ophthalmia is yet unknown despite circumstantial evidence that Leptospirae may be associated with a variety of eye conditions affecting the horse. A common symptom observed in leptospirosis in man and domestic animals is the existence of specific and nonspecific eye disorders, but the changes common to periodic ophthalmia do not involve the internal structures of the eye. Leptospiral conjunctivitis in man is not uncommon, and is one of the important lesions suggesting this disease.

18. CAN THE MALE SPREAD LEPTOSPIROSIS DURING SERVICE?

Leptospirosis is not a genital disease but invasion of Leptospirae through the mucous membrane of the vagina could be expected. This is probably a less

important means of spread, but should not be overlooked.

19. WHAT PRICE IS THE LIVESTOCK INDUSTRY PAYING AS A RESULT OF LEPTOSPIROSIS?

This question has not been answered. Evidence of the disease has been found in all States and certain cost estimates of leptospirosis have been high. A certain herd of cattle in a western State infected with leptospirosis has been known to lose 75 percent of the calves in a single year while a routine survey of 1000 herds in the same State during 1956 showed 27 herds containing evidence of the disease in varying degrees.

20. WHAT ATTEMPTS ARE BEING MADE TO DETERMINE THE INCIDENCE OF LEPTOSPIROSIS?

Research is being carried out on leptospirosis by numerous State Experiment Stations, Universities, and Government Agencies. The United States Department of Agriculture - Animal Disease Eradication Division will conduct routine leptospirosis surveys in connection with the State-Federal Cooperative Brucellosis Eradication Program. Twelve States selected in strategic areas of the United States will investigate the incidence of the reactions in cattle.

Additional information on leptospirosis can be found in the following references:

1) Leptospirosis in Cattle and Swine. Report of the AVMA Committee on Leptospirosis in Cattle and Swine, 1953 Proceedings Book, pp. 563-566.

2) Leptospirosis. ARS Special Report, Agricultural Writers' Manual on Infectious Animal Diseases, 1956, pp. 65-67.

3) Leptospirosis. USDA Yearbook of Agriculture 1956, Animal Diseases, p. 226.